

Research Article

Smartphone Addiction and Its Association with Perceived Mental Well-Being, Sleep, and Academic Performance Among University Students: A Cross-Sectional Study

Abinash Borah¹, Pankaj Biswas², Arif Ahmed³, Doman R Marak⁴, Jagodish Basumatary⁵, Chirandeep Sonowal⁶, Samir Moirangthem⁷

^{1,2,3,4,5,6}BMLT students, Programme of MLT, Faculty of Allied & Healthcare Sciences, Assam down town University, Panikhaiti, Guwahati, Assam, India

⁷Assistant Professor, Faculty of Allied & Healthcare Sciences, Assam down town University, Panikhaiti, Guwahati, Assam, India

DOI: <https://doi.org/10.24321/2581.5822.202611>

I N F O

Corresponding Author:

Samir Moirangthem, Faculty of Allied & Healthcare Sciences, Assam down town University, Panikhaiti, Guwahati, Assam, India

E-mail Id:

samirthem1999@gmail.com

Orcid Id:

<https://orcid.org/0009-0004-5546-4467>

How to cite this article:

Borah A, Biswas P, Ahmed A, Marak D R, Basumatary J, Sonowal C, Moirangthem S. Smartphone Addiction and Its Association with Perceived Mental Well-Being, Sleep, and Academic Performance Among University Students: A Cross-Sectional Study. *J Adv Res Psychol Psychother*. 2026; 9(3&4): 48-59.

Date of Submission: 2026-09-07

Date of Acceptance: 2026-10-01

A B S T R A C T

Background: Smartphones have become an inseparable part of university student life, and a growing body of literature links excessive or problematic smartphone use to impaired sleep, reduced academic performance, and diminished mental well-being.¹⁻⁷ However, locally derived data on how such patterns manifest among student populations, particularly outside high-income settings, remain comparatively limited.

Objective: To quantify patterns of smartphone use and addiction-consistent behaviors among university students and examine their association with gender, primary purpose of use, and self-perceived academic and psychological impact.

Methods: A cross-sectional survey was administered online to 103 university students (mean age 20.6 ± 1.3 years; 53 males, 50 female) between 17 and 21 August 2026. A 27-item structured questionnaire captured demographic and usage characteristics and 18 behavioral/psychosocial impact indicators. A composite Smartphone Addiction/Impact Score (range 0–26) was derived from 13 items scored Yes = 2, Sometimes = 1, No = 0 (Cronbach's $\alpha = 0.82$). Associations were tested using independent-samples t-tests, one-way ANOVA, Pearson correlation, and chi-square tests of independence ($\alpha = 0.05$, two-tailed).

Results: The mean composite score was 14.3 ± 5.8 (range 0–26); scores were classified as low ($n = 35$), moderate ($n = 37$), and high ($n = 31$) using tertile cut-offs. Female participants scored significantly higher than males (16.1 ± 5.9 vs 12.6 ± 5.2 ; mean difference 3.57, 95% CI [1.36, 5.79]; $t = -3.25$, $p = 0.002$, Cohen's $d = 0.64$). Primary purpose of use was significantly associated with score (one-way ANOVA $F = 4.13$, $p = 0.002$, $\eta^2 = 0.18$), with social-media-oriented users scoring highest (16.9 ± 5.0) and communication-oriented users lowest (9.3 ± 3.2).

Composite score level was significantly associated with self-reported academic performance impact ($\chi^2 = 46.47$, $df = 6$, $p < 0.001$, Cramér's $V = 0.48$) and mood disturbance ($\chi^2 = 20.52$, $df = 4$, $p < 0.001$, Cramér's $V = 0.32$). Perceived sleep-duration reduction was significantly associated with daytime sleepiness ($\chi^2 = 22.22$, $df = 4$, $p < 0.001$, Cramér's $V = 0.33$). In multivariable linear regression adjusting for gender, purpose of use, daily hours of use, and age, female gender ($\beta = 3.43$, $p = 0.001$), social-media-oriented use ($\beta = 3.25$, $p = 0.004$), and daily hours of use ($\beta = 0.52$ per hour, $p = 0.017$) remained independent, significant predictors of composite score (model $R^2 = 0.228$, $p < 0.001$), while age was not significant ($p = 0.278$).

Conclusion: Behaviors consistent with problematic or addictive smartphone use were common in this student sample and were significantly and independently associated with self-reported academic and psychological impact. Female students and those primarily using smartphones for social media showed the highest risk profiles even after adjustment for daily usage duration, suggesting that awareness and self-regulation interventions may benefit from being targeted by user profile rather than applied uniformly.

Keywords: Smartphone Addiction, Problematic Smartphone Use, University Students, Mobile Phone Use, Social Media Use, Academic Performance, Psychological Well-Being, Sleep Disturbance, Daytime Sleepiness, Student Mental Health, Digital Behavior, Self-Regulation

Introduction

Smartphones have transcended their original function as communication devices to become central instruments through which young people study, socialize, seek entertainment, and manage daily life.^{1,2} Their near-universal ownership among students, combined with continuous internet connectivity, has made smartphone use one of the most pervasive behavioral exposures of contemporary student life.^{3,4}

Smartphone addiction, sometimes termed problematic or maladaptive smartphone use, is generally understood as a pattern of excessive smartphone engagement accompanied by features resembling substance-related dependence—loss of control, preoccupation, and continued use despite negative consequences—along with measurable functional impairment.^{5,6} Although debate continues over whether this pattern constitutes a true behavioral addiction or is better framed as problematic use falling short of clinical addiction criteria,⁷ the practical consequences reported across the literature are consistent: disrupted sleep, elevated anxiety and low mood, reduced academic concentration, and diminished subjective well-being.^{8–11}

The global scale of smartphone exposure is considerable. Estimates place global internet users at close to 4.9 billion, with smartphone penetration reaching a majority of the world's population, and daily online engagement measured in the trillions of hours collectively.¹ Within this context, university and college students represent a population of particular interest: they are typically heavy users, often rely on smartphones for both academic and recreational purposes, and are at a developmental stage where habits of self-regulation are still consolidating.^{3,12,13}

A substantial body of research links smartphone addiction to poorer mental well-being. Studies among Chinese, Indian, Sudanese, Turkish, and Yemeni student populations have reported significant associations between problematic smartphone use and loneliness, anxiety, reduced life satisfaction, and lower subjective well-being, with loneliness and negative emotion repeatedly identified as mediating pathways.^{8–11,13,14,21,24} Parenting style, family functioning, and social support have also been implicated as upstream determinants of smartphone addiction risk in adolescent and young-adult samples.^{2,12,29,30}

Sleep disruption is one of the most consistently reported correlates of heavy smartphone use. Night-time use delays sleep onset, shortens sleep duration, and is associated with daytime sleepiness and fatigue, with downstream effects on mood and cognitive function.^{14,25,36} Academic performance has similarly been shown to suffer through mechanisms such as reduced concentration, encroachment on study time, and habitual checking behavior that fragments attention.^{16,17,22,32} A meta-analysis of smartphone addiction and learning outcomes found consistent negative associations with academic achievement across multiple study designs.²²

Gender differences in smartphone addiction risk and its correlates have been reported inconsistently across settings, with some studies finding higher risk among female students and others finding no significant difference or the reverse pattern depending on the population and instrument used.^{23,35} Similarly, the primary purpose for which a smartphone is used—academic, communicative, or entertainment/social-media-oriented—has received comparatively less attention than overall screen-time duration, despite plausible reasons to expect that social-media-driven use carries distinct addictive potential linked to social comparison, intermittent reinforcement, and fear of missing out.^{21,37,38}

Despite this growing literature, most published evidence originates from large, often nationally representative, samples in East Asia, the Middle East, Europe, and parts of South Asia, using validated instruments such as the Smartphone Addiction Scale.^{3,17} Locally derived data

describing how patterns of use, self-perceived psychological impact, and academic consequences co-occur within a specific student population—particularly using simple, low-burden survey instruments suited to rapid local assessment—remain comparatively scarce. Understanding these relationships in context is a prerequisite for designing feasible, locally relevant awareness or intervention programs.³⁹

This study therefore aimed to characterize smartphone use patterns among a sample of university students and to examine the association between a composite indicator of addiction-consistent smartphone behavior and (a) gender, (b) primary purpose of smartphone use, and (c) self-reported academic and psychological impact, including sleep disturbance and mood. We hypothesized that (i) female students would report higher addiction-consistent behavior scores than male students, (ii) social-media-oriented use would be associated with higher scores than academic or communication-oriented use, and (iii) higher composite scores would be significantly associated with self-reported academic performance impairment and mood disturbance.

Materials and Methods

Study Design

This was a cross-sectional, observational survey study.

Study Setting and Duration

The survey was administered online to university students; data collection timestamps indicate responses were submitted between 17 and 21 August 2026 at Assam down town University.

Study Population

Participants were university-level students who owned and actively used a smartphone. A total of 103 valid responses were analyzed.

Inclusion Criteria

- Currently enrolled university (undergraduate/postgraduate) students at the time of data collection.
- Age 18 years or older.
- Personal ownership and active, regular use of a smartphone.
- Willingness to voluntarily complete the online questionnaire in full.
- Ability to read and respond to the questionnaire in English.

Exclusion Criteria

- Individuals not currently enrolled as students (e.g., faculty, staff, or general public respondents).
- Age under 18 years.

- Non-smartphone users (i.e., feature-phone users or non-users), as the outcome measures are not applicable to this group.
- Incomplete or partially completed questionnaire responses.
- Duplicate submissions from the same respondent, identified by matching participant name and submission pattern.

Sample Size and Sampling Method

A non-probability convenience sample of university students was recruited through an online, self-administered structured questionnaire circulated digitally over a five-day collection window (17–21 August 2026). A total of 103 valid, complete responses met the inclusion criteria and were retained for analysis. No formal a priori sample-size or power calculation was performed prior to data collection; the achieved sample size is acknowledged as a limitation in Section 4.

Ethical Considerations and Consent

The study was conducted in accordance with standard ethical principles for survey-based behavioral research involving human participants, including voluntary participation, the right to withdraw at any point without penalty, and protection of respondent confidentiality. Participation was voluntary; respondents accessed the questionnaire via a shared online link and proceeded to complete it at their own discretion, which constituted implied consent to participate under the study's stated purpose. Because the survey instrument captured participants' names as an identifying field, these identifiers must be removed or replaced with anonymized study codes before any public data sharing or deposition, and access to the raw, identifiable dataset should be restricted to the research team. No physically or psychologically invasive procedures were involved, and the questionnaire addressed routine daily-life behavior rather than clinically sensitive material; nonetheless, participants who found any item distressing were free to skip it or withdraw.

Data Collection Instrument

A 27-item structured questionnaire was developed and administered as an online form. It comprised: (i) demographic and usage-context items (age, gender, years of smartphone ownership, daily hours of use, primary purpose of use, time spent on social media, time spent on academic use); and (ii) 18 items assessing behavioral and psychosocial correlates of smartphone use (e.g., difficulty reducing use, use while studying or eating, anxiety after prolonged use, mood disturbance, sleep-related items, academic-performance items, habitual/compulsive-use items, and break-taking behavior), with response options of

Yes / No / Sometimes (or comparable ordinal categories for specific items). This instrument was investigator-developed for local assessment and was not a previously validated psychometric scale such as the Smartphone Addiction Scale–Short Version; this is noted as a limitation in Section 4.

Composite Scoring

A composite Smartphone Addiction/Impact Score was derived from 13 items directly reflecting addiction-consistent behavior or negative consequence (difficulty reducing use; anxiety after prolonged use; mood disturbance; late-night use; reduced sleep duration; daytime sleepiness; perceived academic-performance impact; reduced concentration; habitual/uncontrollable use; inability to spend a day without the phone; keeping the phone beside the bed; reduced study time; and regret over study time lost to phone use). Responses were coded Yes = 2, Sometimes/ambiguous free-text = 1, No = 0, giving a possible range of 0–26. Internal consistency was assessed using Cronbach's alpha. Tertile cut-offs were used to classify participants into low, moderate, and high score groups for categorical analyses.

Statistical Analysis

Data were analyzed in Python (v3.11; pandas v2, SciPy v1, and statsmodels v0.14 libraries). Continuous variables are reported as mean $\pm$ standard deviation; categorical variables as frequencies and percentages. Independent-samples t-tests compared composite scores between genders, with effect size reported as Cohen's *d* and the mean difference reported with its 95% confidence interval (CI). One-way ANOVA compared mean scores across primary-purpose-of-use categories (categories with $n < 5$ were excluded from this comparison), with effect size reported as eta-squared (η^2). Pearson correlation assessed the association between age and composite score; Spearman's rho was used to examine inter-item correlations among the 13 composite-score items. Chi-square tests of independence assessed associations between categorical variables (composite-score tertile, academic-performance impact, mood disturbance, sleep-duration reduction, and daytime sleepiness), with effect size reported as Cramér's *V*. A multiple linear regression model was additionally fitted with the composite score as the dependent variable and gender, primary purpose of use (social media vs. other), self-reported daily hours of use, and age as covariates to assess independent associations while adjusting for the other variables. Internal consistency of the composite score was assessed using Cronbach's alpha. Statistical significance was set at $\alpha = 0.05$, two-tailed, throughout. Reporting follows the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist for cross-sectional studies.¹⁷

Results

Participant Characteristics

A total of 103 students participated (mean age 20.6 ± 1.3 years, range 18–24). Gender distribution was near-balanced (51.5% male, $n = 53$; 48.5% female, $n = 50$) as mentioned in figure 1. Most participants had used a smartphone for 5–6 years (56.3%) or 3–4 years (32.0%). Table 1 summarizes demographic and usage-context characteristics.

Composite Score and Behavioral Prevalence

The composite Smartphone Addiction/Impact Score (range 0–26) had a mean of 14.3 ± 5.8 (median 14; interquartile range 10–19) and demonstrated good internal consistency (Cronbach's $\alpha = 0.82$). Using tertile cut-offs (≤ 11 = Low, 12–17 = Moderate, ≥ 18 = High), 35 participants (34.0%) were classified as Low, 37 (35.9%) as Moderate, and 31 (30.1%) as High. Figure 2 shows the score distribution.

Table 2 and Figure 3 summarize the endorsement rate of individual behavioral items contributing to the composite score.

Gender Differences

Female participants reported significantly higher composite scores than male participants (16.1 ± 5.9 vs 12.6 ± 5.2 ; mean difference 3.57, 95% CI [1.36, 5.79]; independent-samples t-test, $t(101) = -3.25$, $p = 0.002$; Cohen's $d = 0.64$, a medium-to-large effect; Figure 4).

Purpose of Smartphone Use

Mean composite score differed significantly across primary-purpose-of-use categories (one-way ANOVA restricted to categories with $n \geq 5$; $F(5,96) = 4.13$, $p = 0.002$, $\eta^2 = 0.18$, a large effect). Social-media-oriented users had the highest mean score (16.9 ± 5.0 , $n = 34$), followed by entertainment (15.6 ± 5.8 , $n = 22$), gaming (12.0 ± 6.0 , $n = 5$), other uses (12.8 ± 6.3 , $n = 17$), academic use (11.6 ± 5.3 , $n = 18$), and communication (9.3 ± 3.2 , $n = 6$) (Figure 5).

Associations with Academic and Psychological Impact

Composite score tertile (Low/Moderate/High) was significantly associated with self-reported academic-performance impact ($\chi^2(6) = 46.47$, $p < 0.001$, Cramér's $V = 0.48$, a large effect): among High-score participants, 16/31 (51.6%) reported that smartphone use affected their academic performance ('Yes'), versus 0/35 (0%) among Low-score participants (Table 3, Figure 6). Composite score tertile was also significantly associated with mood disturbance ($\chi^2(4) = 20.52$, $p < 0.001$, Cramér's $V = 0.32$, a medium effect), with 14/31 (45.2%) of High-score participants reporting mood was affected ('Yes') versus 6/35 (17.1%) of Low-score participants.

Sleep-Related Findings

Self-reported reduction in sleep duration was significantly associated with daytime sleepiness/fatigue ($\chi^2(4) = 22.22$, $p < 0.001$, Cramér's $V = 0.33$, a medium-to-large effect): among participants who reported reduced sleep duration ('Yes', $n = 36$), 16 (44.4%) also reported daytime sleepiness, compared with 3/26 (11.5%) among those reporting no sleep-duration reduction.

Age and Screen-Time Category

In univariate analysis, age was not significantly correlated with composite score (Pearson $r = 0.06$, $p = 0.57$), and self-reported daily screen-time category was not significantly associated with composite score in one-way ANOVA ($F(4,98) = 1.93$, $p = 0.11$), although a numerical gradient was observed from 1–3 hours (mean 12.2 ± 4.7) to 7–9 hours (mean 16.3 ± 5.4).

Multivariable Analysis

To evaluate whether gender, purpose of use, and daily screen time were independently associated with composite score after mutual adjustment, a multiple linear regression was fitted with composite score as the outcome. The overall model was statistically significant and explained a meaningful proportion of variance in composite score ($R^2 = 0.228$, adjusted $R^2 = 0.196$; $F(4,98) = 7.23$, $p < 0.001$).

Female gender ($\beta = 3.43$, 95% CI [1.37, 5.49], $p = 0.001$; standardized $\beta = 0.29$) and primary social-media use ($\beta = 3.25$, 95% CI [1.06, 5.44], $p = 0.004$; standardized $\beta = 0.27$) remained independently and significantly associated with higher composite scores. Estimated daily hours of use also emerged as an independent, significant predictor once gender and purpose were accounted for ($\beta = 0.52$ points per additional hour, 95% CI [0.09, 0.94], $p = 0.017$; standardized $\beta = 0.21$) — a relationship that did not reach significance when hours were treated as an unadjusted categorical variable alone (see above), suggesting confounding by gender and purpose of use in the univariate comparison. Age was not a significant independent predictor ($\beta = 0.42$, 95% CI [−0.34, 1.19], $p = 0.278$). Table 4 presents the full regression output.

Inter-Item Correlation Structure

Spearman correlations among the 13 composite-score items were predominantly positive and of small-to-moderate magnitude (p range −0.03 to 0.57), consistent with the items reflecting a coherent but multi-faceted underlying construct rather than a single narrow behavior. The strongest inter-item associations were observed between reduced concentration while studying and perceived academic-performance impact ($p = 0.57$), and between staying awake late and reduced sleep duration ($p = 0.50$) (Figure 7).

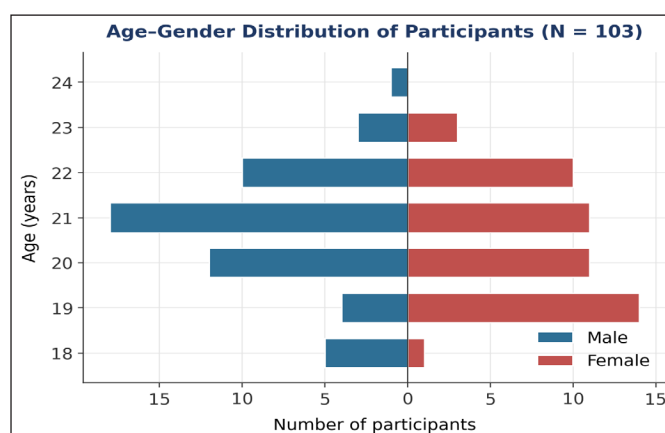


Figure 1. Age-gender distribution of participants (N = 103)

Table 1. Demographic and Smartphone-Use Characteristics of Participants (N = 103)

Characteristic	Category	n	%
Gender	Male	53	51.5
	Female	50	48.5
Years of smartphone use	5–6 years	58	56.3
	3–4 years	33	32.0
	1–2 years	11	10.7
	Less than 1 year	1	1.0

Daily hours of use	4–6 hours	44	42.7
	7–9 hours	32	31.1
	More than 9 hours	16	15.5
	1–3 hours	10	9.7
	Less than 1 hour	1	1.0
Primary purpose of use	Social media	34	33.0
	Entertainment	22	21.4
	Academic	18	17.5
	Others	17	16.5
	Communication	6	5.8
	Gaming	5	4.9
	News	1	1.0
Daily social-media time	3–4 hours	35	34.0
	1–2 hours	30	29.1
	5–6 hours	20	19.4
	Less than 1 hour	11	10.7
	More than 6 hours	7	6.8

Note: Age reported as mean $\pm$ SD = 20.6 $\pm$ 1.3 years (range 18–24).

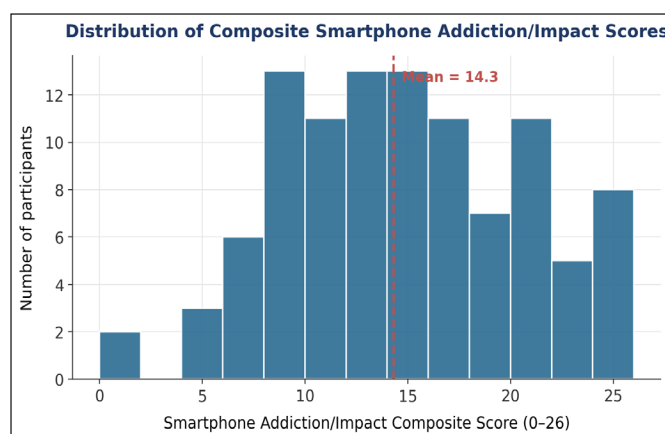


Figure 2. Distribution of the composite Smartphone Addiction/Impact score among participants (N = 103)

Table 2. Endorsement of Individual Addiction-Consistent Behavior Items (N = 103)

Item	Yes (%)	Sometimes (%)
Keeps phone beside bed while sleeping	60.2	22.3
Use has become an uncontrollable habit	55.3	0.0
Cannot spend a whole day without phone	55.3	2.9
Stays awake late at night because of use	49.5	9.7
Regretted excess study-time lost to phone use	49.5	33.0
Reduced sleep duration	35.0	39.8
Use reduces time spent studying	34.0	46.6
Reduced concentration while studying	33.0	49.5
Mood affected by excessive use	31.1	47.6

Difficulty reducing smartphone usage	24.3	44.7
Anxious after spending long time on phone	24.3	47.6
Daytime sleepiness/fatigue attributed to use	23.3	40.8
Perceived academic performance affected	18.4	30.1

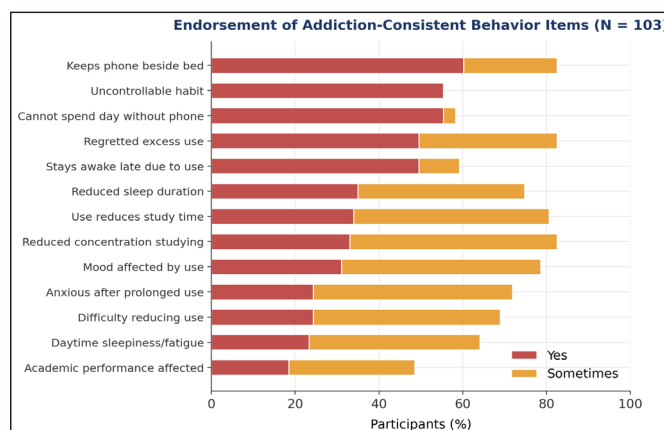


Figure 3.Endorsement rate of individual addiction-consistent behavior items (N = 103)

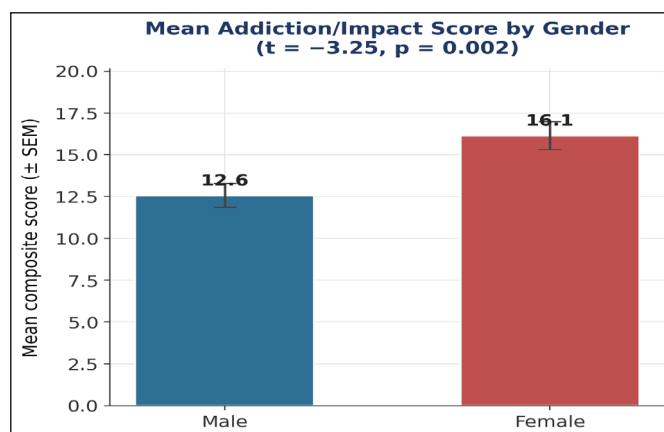


Figure 4.Mean composite Smartphone Addiction/Impact score by gender (error bars = SEM)

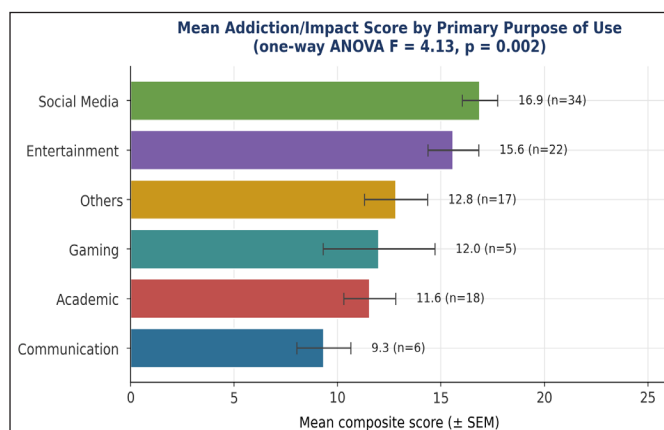


Figure 5.Mean composite score by primary purpose of smartphone use (error bars = SEM)

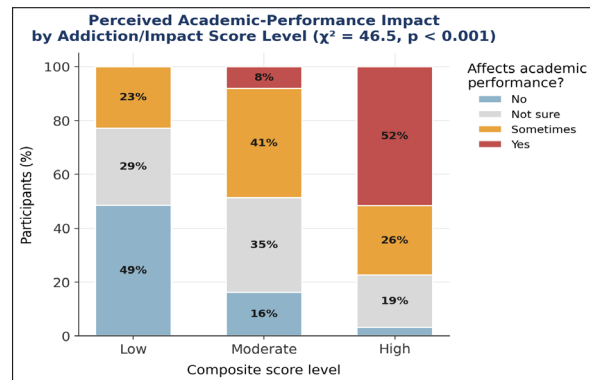


Figure 6. Perceived academic-performance impact by composite-score tertile (percentage within group)

Table 3. Composite Score Tertile by Self-Reported Academic Performance Impact (N = 103)

Score Level	No	Not sure	Sometimes	Yes	Row Total
Low	17	10	8	0	35
Moderate	6	13	15	3	37
High	1	6	8	16	31

$\chi^2 = 46.47$, $df = 6$, $p < 0.001$, Cramér's $V = 0.48$.

Table 4. Multiple Linear Regression Predicting Composite Smartphone Addiction/Impact Score (N = 103)

Predictor	B (unstandardized)	95% CI	Standardized β	p-value
Intercept	-0.40	[-16.75, 15.94]	—	0.961
Female gender (ref: Male)	3.43	[1.37, 5.49]	0.29	0.001
Primary social-media use (ref: Other)	3.25	[1.06, 5.44]	0.27	0.004
Daily hours of use (continuous)	0.52	[0.09, 0.94]	0.21	0.017
Age (years)	0.42	[-0.34, 1.19]	0.10	0.278

Model fit: $R^2 = 0.228$, adjusted $R^2 = 0.196$, $F(4,98) = 7.23$, $p < 0.001$. CI = confidence interval.

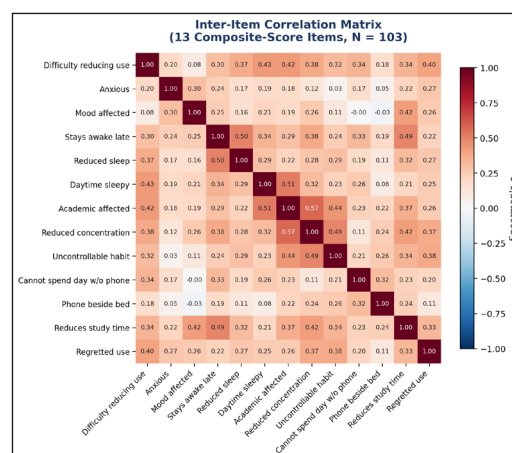


Figure 7. Spearman correlation matrix of the 13 items comprising the composite Smartphone Addiction/Impact score (N = 103)

Summary of Key Findings

- Addiction-consistent smartphone behavior was common; over half of participants endorsed keeping the phone beside the bed, feeling unable to control use, and being unable to spend a day without the phone.
- Female gender was significantly associated with higher composite scores.

- Primary purpose of use was a significant correlate of score; social-media-oriented use carried the highest risk profile.
- Composite score was significantly and positively associated with self-reported academic-performance impact and mood disturbance.
- Self-reported sleep reduction was strongly linked to daytime sleepiness.
- Total daily screen time alone did not reach statistical significance, suggesting purpose/pattern of use may matter more than duration alone in this sample.

Discussion

Principal Findings

In this cross-sectional survey of 103 university students, behaviors consistent with problematic or addictive smartphone use were common and internally coherent, as reflected by the good internal consistency ($\alpha = 0.82$) of the derived composite score. Female students and students whose primary purpose of use was social media reported significantly higher addiction-consistent behavior. Composite score was significantly associated with self-reported academic-performance impairment and mood disturbance, and self-reported sleep-duration reduction was strongly linked to daytime sleepiness.

Comparison with Previous Studies

The overall pattern—frequent endorsement of compulsive-use indicators such as inability to spend a day without the phone and keeping the device within arm's reach during sleep—mirrors descriptions of problematic smartphone use in other student populations.^{3,4,17,35} The significant association between composite score and academic-performance impact is consistent with meta-analytic evidence linking smartphone addiction to poorer learning outcomes,²² and with individual studies reporting reduced concentration and study time among more heavily dependent users.^{16,32} Similarly, the strong association observed here between sleep-duration reduction and daytime sleepiness aligns with prior findings that late-night smartphone use compresses sleep and produces downstream fatigue.^{14,25,36}

The significantly higher composite score among female participants is consistent with some prior reports of greater vulnerability to problematic smartphone use among female students,²³ although the direction of gender differences has not been uniform across the literature, with other studies reporting no significant difference or higher risk among male students depending on setting and instrument.³⁵ This inconsistency may reflect differences in the behaviors captured by different instruments, cultural patterns of smartphone use by gender, or sample-specific factors and should be interpreted cautiously rather than generalized.

The finding that purpose of use—rather than raw screen-time duration—was the stronger correlate of composite score is a notable feature of these data. Social-media-oriented users scored markedly higher than those using smartphones primarily for academic work or communication, echoing theoretical accounts that link social-media engagement specifically to social comparison, intermittent reinforcement, and fear of missing out as mechanisms distinct from general device use.^{21,37,38} This is broadly consistent with work distinguishing social/communicative use from other smartphone activities in its association with isolation and academic anxiety.^{37,38} Notably, multivariable analysis showed that daily hours of use became a significant independent predictor once gender and purpose of use were accounted for, whereas it was not significant as a standalone categorical comparison—indicating that gender and purpose of use had been masking (confounding) the duration–score relationship in the simpler univariate analysis and underscoring the value of adjusted modelling over single-variable comparisons in this type of survey data.

Biological and Psychological Explanation

The clustering of anxiety, mood disturbance, sleep disruption, and compulsive-use indicators observed here is consistent with models of problematic smartphone use that emphasize overlapping mechanisms with other behavioral addictions—reward-driven reinforcement from notifications and social content, difficulty with self-regulation, and use as a maladaptive coping strategy for negative affect.^{5,6,29} Night-time device proximity and late-night use likely delay sleep onset and reduce total sleep time through both behavioral displacement (time spent on the device instead of sleeping) and physiological arousal from screen exposure, plausibly explaining the strong sleep–fatigue association observed.^{14,25}

Clinical and Public Health Relevance

From a public health perspective, these findings suggest that interventions targeting smartphone-related harm among students may be more effective if they address the purpose and context of use (e.g., social-media-specific self-regulation strategies, night-time device placement) rather than focusing solely on aggregate screen-time reduction.^{30,39} Given the consistent association with academic performance and mood, student health and counselling services may benefit from routinely screening for problematic smartphone-use patterns alongside conventional stress and sleep assessments.^{17,26}

Strengths

Strengths of this study include the use of a purpose-built, locally relevant instrument capturing a broad range of behavioral and psychosocial indicators in a single survey; a

composite score with good internal consistency; adjusted multivariable analysis in addition to univariate testing (revealing a confounding relationship between duration, gender, and purpose of use that would have been missed by univariate analysis alone); reporting of effect sizes (Cohen's d , η^2 , and Cramér's V) alongside p -values in line with current reporting standards; and adherence to the STROBE reporting checklist for cross-sectional studies.

Limitations

- The sample was a convenience sample of 103 students from a single data-collection effort, limiting generalizability and statistical power for subgroup analyses.
- The questionnaire was investigator-developed rather than a previously validated psychometric instrument (e.g., the Smartphone Addiction Scale–Short Version), so the composite score, while internally consistent, has not been externally validated against a clinical or gold-standard measure.
- All outcomes (academic performance, mood, sleep) were self-reported and cross-sectional, precluding causal inference and introducing potential common-method and recall bias.
- The survey did not collect objective screen-time data (e.g., device-logged usage), relying instead on self-estimated categories.
- Free-text or ambiguous responses to a small number of items required recoding, which may have introduced minor measurement imprecision.

Future Research Directions

Future studies should employ validated smartphone-addiction instruments alongside objective usage metrics, larger and more representative samples, and longitudinal designs capable of testing directionality between smartphone use, sleep, mood, and academic outcomes. Comparative studies across purpose-of-use subgroups and intervention studies testing targeted self-regulation strategies (e.g., night-time device removal, social-media use limits) would help translate these associations into actionable guidance.^{30,39}

Conclusion

Behaviors consistent with problematic or addictive smartphone use were common among the university students surveyed and were significantly associated with self-reported academic-performance impairment, mood disturbance, and sleep-related daytime sleepiness. Female students and those whose primary purpose of use was social media showed the highest-risk profiles, while total

daily screen time alone was not a significant correlate once purpose of use was accounted for.

Highlights

- A 13-item composite score of smartphone-addiction-consistent behavior showed good internal consistency ($\alpha = 0.82$) in a student sample.
- Female students reported significantly higher addiction-consistent behavior scores than male students.
- Primary purpose of smartphone use (social media vs. academic/communication) was significantly associated with score.
- Higher composite scores were significantly associated with self-reported academic performance impact and mood disturbance.
- Self-reported sleep-duration reduction was strongly associated with daytime sleepiness.
- Daily screen-time category alone was not a significant predictor once purpose of use was considered.

Novelty Statement

This study contributes primary survey data on smartphone-use behavior and its self-reported academic and psychological correlates from a university student population, using a locally administered instrument and composite scoring approach that achieved good internal consistency. It adds to the evidence base on how the purpose of smartphone use, not only duration, differentiates risk of problematic use.

Clinical Implications

These findings support incorporating brief screening for problematic smartphone-use patterns—particularly around night-time device use and social-media engagement—into student wellness and academic-support services, rather than relying on screen-time duration alone as a risk marker.

Recommendations

- Validate the composite indicator against an established instrument (e.g., SAS-SV) in future work.
- Prioritize social-media-specific self-regulation strategies over generic screen-time limits.
- Encourage removal of smartphones from the sleep environment as a low-cost, targeted intervention.
- Expand data collection to a larger, multi-institution sample with objective usage measures.

Additional Sections

Acknowledgements

The authors sincerely acknowledge Assam down town University, Panikhaiti, Guwahati, Assam, India, for its steadfast support and encouragement of this research. The

university's intellectually enriching research environment was instrumental in advancing this work.

Sources of Funding: None

Conflict of interest: None

Author contributions

Conceptualization: S.M., A.A, J.B, P.B, D.R.M, A.B,C.S, Methodology: S.M., A.A, J.B, P.B, D.R.M, A.B, C.S Validation: S.M., A.A, J.B, P.B, D.R.M, A.B,C.S Formal Analysis: S.M., A.A, J.B, P.B, D.R.M, A.B,C.S . Writing – Original Draft: S.M., A.A, J.B, P.B, D.R.M, A.B,C.S. Writing – Review & Editing: S.M. Supervision: S.M. All authors have read and agreed to the published version of the manuscript.

Data availability statement

The datasets generated and/or analysed during the current study are available from the corresponding author upon reasonable request.

References

1. Anbumalar C, Binu Sahayam D. Brain and smartphone addiction: a systematic review. *Human Behavior and Emerging Technologies*. 2024;2024(1):5592994. [Google Scholar]
2. Kim Y, Dhammasaccakarn W, Laeheem K, Rinthaisong I. The impact of family functioning factors on smartphone addiction and phubbing among Muslim adolescents in Thailand. *Children*. 2024;11(5):522. [Google Scholar] [PubMed]
3. Mostert N. Measuring problematic smartphone use among students using the Smartphone Addiction Scale. *S Afr Fam Pract*. 2025;67(1):6120. [Google Scholar] [PubMed]
4. Zhang HX. Smartphone addiction among university students during the post-COVID-19 era: the role of emotional intelligence and future anxiety. *Psychiatry Investig*. 2023;20(10):951. [Google Scholar] [PubMed]
5. Raj AD, Pawar AS, Pavankumar B, Goyal K, Unisa SA. Machine learning model for prediction of smartphone addiction. *Indiana J Multidiscip Res*. 2024;4(3):104-7. [Google Scholar]
6. Cali MA, Fernandez-Lopez L, Navarro-Zaragoza J, Caravaca-Sánchez F, Falcon M. Smartphone addiction among adolescents in southern Italy and correlation with other risky behaviors. *Actas Esp Psiquiatr*. 2024;52(5):632. [Google Scholar] [PubMed]
7. Panova T, Carbonell X. Is smartphone addiction really an addiction? *J Behav Addict*. 2018;7(2):252-9. [Google Scholar] [PubMed]
8. Zhu C, Li S, Zhang L. The impact of smartphone addiction on mental health and its relationship with life satisfaction in the post-COVID-19 era. *Front Psychiatry*. 2025;16:1542040. [Google Scholar] [PubMed]
9. Popescu AM, Balica RŞ, Lazăr E, Buşu VO, Vaşcu JE. Smartphone addiction risk, technology-related behaviors and attitudes, and psychological well-being during the COVID-19 pandemic. *Front Psychol*. 2022;13:997253. [Google Scholar] [PubMed]
10. Su P, He M. The mediating role of loneliness in the relationship between smartphone addiction and subjective well-being. *Sci Rep*. 2024;14(1):4460. [Google Scholar] [PubMed]
11. Ding Y, Huang H, Zhang Y, Peng Q, Yu J, Lu G, et al. Correlations between smartphone addiction and alexithymia, attachment style, and subjective well-being: a meta-analysis. *Front Psychol*. 2022;13:971735. [Google Scholar] [PubMed]
12. Yogesh M, Ladani H, Parmar D. Associations between smartphone addiction, parenting styles, and mental well-being among adolescents aged 15–19 years in Gujarat, India. *BMC Public Health*. 2024;24(1):2462. [Google Scholar] [PubMed]
13. Jing T, Ju SY, Ridzuan MR, Kong LK, Rahman NA, Li J, et al. Smartphone addiction affects life satisfaction among Chinese university students: the serial mediation effects of social anxiety for social media users and mental well-being. *BMC Psychol*. 2025;13(1):1200. [Google Scholar] [PubMed]
14. Amin MH, Alhadi HA, Mohamed AE, Yacoub HK, Khalifa RM, Dafallah IA, et al. Impact of smartphone addiction on health status, mental well-being, and sleep quality among medical students in Sudan. *BMC Psychiatry*. 2024;24(1):965. [Google Scholar] [PubMed]
15. Mascia ML, Agus M, Penna MP. Emotional intelligence, self-regulation, smartphone addiction: which relationship with student well-being and quality of life? *Front Psychol*. 2020;11:375. [Google Scholar] [PubMed]
16. Samaha M, Hawi NS. Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Comput Human Behav*. 2016;57:321-5. [Google Scholar]
17. Ratan ZA, Parrish AM, Zaman SB, Alotaibi MS, Hosseinzadeh H. Smartphone addiction and associated health outcomes in adult populations: a systematic review. *Int J Environ Res Public Health*. 2021;18(22):12257. [Google Scholar] [PubMed]
18. Lanette S, Chua PK, Hayes G, Mazmanian M. How much is 'too much'? The role of a smartphone addiction narrative in individuals' experience of use. *Proc ACM Hum Comput Interact*. 2018;2(CSCW):1-22. [Google Scholar]
19. Sunday OJ, Adesope OO, Maarhuis PL. The effects of smartphone addiction on learning: a meta-analysis.

- Comput Human Behav Rep. 2021;4:100114. [Google Scholar]
20. Kumar P, Kumari S. Association of mental health with smartphone addiction — towards a deeper understanding of well-being across age groups and gender. *Int J Recent Innov Med Clin Res.* 2025;6(1):7-12. [Google Scholar]
 21. Al-Khadher M, Bakhiet SF, Albursan I, Qudah MF, Al-Qadri AH, Abunagma I, et al. Under war: the relationship between smartphone addiction, psychological security, and psychological loneliness among Yemeni university students. *Acta Psychol (Amst).* 2025;260:105448. [Google Scholar] [PubMed]
 22. Kayis AR, Satici B, Deniz ME, Satici SA, Griffiths MD. Fear of COVID-19, loneliness, smartphone addiction, and mental wellbeing among the Turkish general population: a serial mediation model. *Behav Inf Technol.* 2022;41(11):2484-96. [Google Scholar]
 23. Zhu W, Zhang Y, Lan Y, Song X. Smartphone dependence and its influence on physical and mental health. *Front Psychiatry.* 2025;16:1281841. [Google Scholar] [PubMed]
 24. Agrawal V, Khulbe Y, Singh A, Kar SK. The digital health dilemma: exploring cyberchondria, well-being, and smartphone addiction in medical and non-medical undergraduates. *Indian J Psychiatry.* 2024;66(3):256. [Google Scholar]
 25. Geng Z, Liu R. The impact of smartphone addiction and negative emotions on parent–child relationships among elementary school students. *Front Psychiatry.* 2025;16:1582741. [Google Scholar] [PubMed]
 26. Zhong G, Shu Y, Zhou Y, Li H, Zhou J, Yang L. The relationship between social support and smartphone addiction: the mediating role of negative emotions and self-control. *BMC Psychiatry.* 2025;25(1):167. [Google Scholar] [PubMed]
 27. Gezgin DM, Mihci C, Gedik S. The effect of free time management skills upon smartphone addiction risk in university students. *J Educ Sci Environ Health.* 2021;7(4):354-66. [Google Scholar]
 28. Darcin AE, Noyan C, Nurmedov S, Yilmaz O, Dilbaz N. Smartphone addiction in relation with social anxiety and loneliness among university students in Turkey. *Eur Psychiatry.* 2015;30(S1):1. [Google Scholar]
 29. Zeerak Q, Imran M, Azeez K, Lokanathan TH, Ismail IM. The effects of smartphone addiction on academic performance among undergraduate medical students in Karnataka, India: a multi-centric study. *Cureus.* 2024;16(6). [Google Scholar] [PubMed]
 30. Ong RH, Sim HS, Bergman MM, How CH, Png CA, Lim CS, et al. Prevalence and associations of problematic smartphone use with smartphone activities, psychological well-being, and sleep quality in a household survey of Singapore adults. *PLoS One.* 2024;19(12):e0315364. [Google Scholar] [PubMed]
 31. Aljomaa SS, Qudah MF, Albursan IS, Bakhiet SF, Abduljabbar AS. Smartphone addiction among university students in the light of some variables. *Comput Human Behav.* 2016;61:155-64. [Google Scholar]
 32. Li S, Deng Y, Cai L, Wu L. The relationship between smartphone addiction and sleep disorder among college students: negative emotions as a mediator and gender as a moderator. *Front Psychiatry.* 2025;16:1542243. [Google Scholar] [PubMed]
 33. Zeng Y, Zhang J, Wei J, Li S. The impact of undergraduates' social isolation on smartphone addiction: the roles of academic anxiety and social media use. *Int J Environ Res Public Health.* 2022;19(23):15903. [Google Scholar] [PubMed]
 34. Al-Kandari YY, Al-Sejari MM. Social isolation, social support and their relationship with smartphone addiction. *Inf Commun Soc.* 2021;24(13):1925-43. [Google Scholar]
 35. Amin NA, Ismail TN, Ponnuraj KT, Shahidan WN. Psychosocial impact of smartphone addiction among university students: a review. *Malays J Med Health Sci.* 2024;20(1):343-58. [Google Scholar]